# AIR FORCE

# QUALIFICATION TRAINING PACKAGE (AFQTP)


**for**

**STRUCTURAL**

**(3E3X1)**

## MODULE 16

## STRUCTURAL LAYOUT/FRAMING COMPONENTS

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

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## MODULE 16

## STRUCTURAL LAYOUT/FRAMING COMPONENTS



Career Field Education and Training Plan (CFETP) references from 1 Apr 97 version.

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## INTRODUCTION

***Before starting this AFQTP,*** refer to and read the "Trainee/Trainer Guide" located on the AFCESA Web site **http://www.afcesa.af.mil/**

***AFQTPs are mandatory and must be completed*** to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

***AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks***.

## MANDATORY minimum upgrade requirements:

***Core task:***
AFQTP completion
Hands-on certification

***Diamond task:***
AFQTP completion
CerTest completion (80% minimum to pass)

***Note:*** *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location*.

***Put this package to use.*** Subject matter experts under the direction and guidance of HQ AFCESA/CEOF revised this AFQTP. If you have any recommendations for improving this document, please contact the Structures Career Field Manager at the address below.

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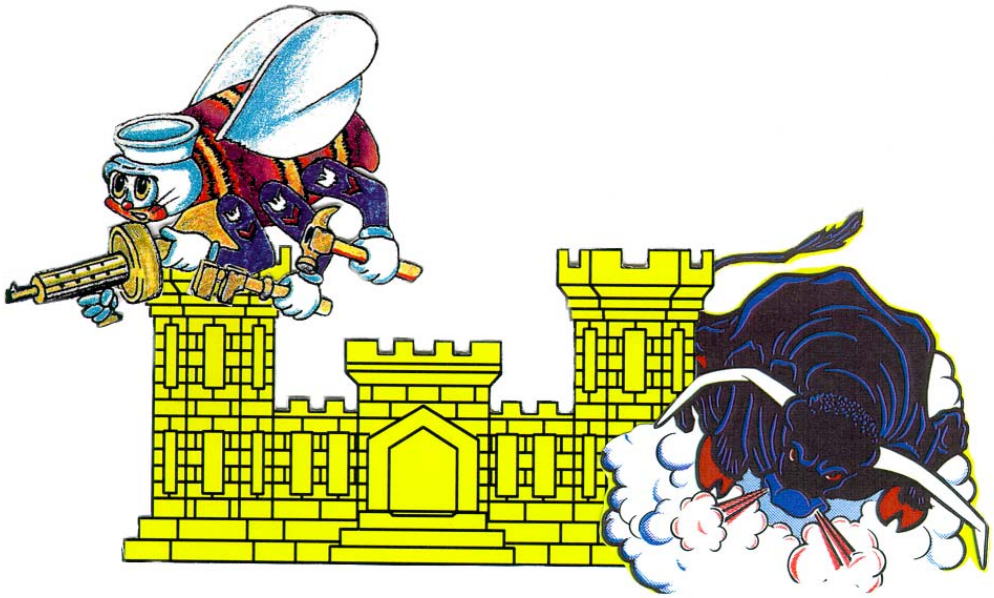

# WALLS

## MODULE 16 AFQTP UNIT 1

## WOODEN STUDS (16.1.3.1.)

# WALLS

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 16.1.3.1. Wooden Studs |
| **Training References:** | • 3E351 CDCs<br>• MODERN CARPENTRY by Willis H. Wagner |
| **Prerequisites:** | • Possess as a minimum, a 3E331 AFSC<br>• Read unit 8 page 172-188 of Modern Carpentry |
| **Equipment/Tools Required:** | • 25’ Tape measure, Pencil, Circular Saw, Wood, Nails 16 penny cement coated sinker. |
| **Learning Objective:** | • The trainee should know how to lay out and construct 2”x4” wood framed walls with little or no supervision. |
| **Samples of Behavior:** | • The trainee should demonstrate how to layout and construct wood frame wall systems. |

## WALLS

**Background:** Before starting any type of framing, a structural tradesmen needs to ensure all necessary tools and materials are on hand. The job site needs to be kept clean and safe at all times. Local building codes need to be followed. Rough openings for windows and doors need to be available, and a good set of plans that indicate the location of all windows and doors. All materials should be checked for quality as well.

Wall framing includes assembling vertical and horizontal members that form outside and inside walls of a structure. The frame supports upper floors, ceilings and roof. It also serves as a nailing surface for inside and outside wall covering materials (i.e. siding, brick veneer, stucco, sheet rock, and paneling).

A wall system includes the following.

- **Sole plate:** A sole plate runs along the bottom of the wall and is secured to the floor.

- **Double top plate:** A double top plate, is two 2x4s lying flat atop each other. The first plate is nailed to the top of the studs using 16-penny cement coated sinkers. The second top plate is nailed to the first after all walls have been constructed and anchored in place. The second top plate is also 3 1/2” longer or shorter in order to interlock the corners. All joints should be staggered by 4" from the lower plate.

- **Studs:** Preferably pre-cut studs at 92 5/8” long. Studs are positioned between the sole plate and the double top plate.

- **Trimmer studs:** Trimmer studs will be nailed to a full-length stud and will support the end of a header.

- **Cripple studs:** Cripple studs will be secured in between the sole plate and sill or the header and the top plate

- **Header:** Headers carry the load above windows, doors or other openings in a wall.

To layout walls, it is a good idea to start at one corner and work your way around the building. To avoid any confusion, it is a good idea to have one person do the layout.

***To perform this task, follow these steps:***

**Step 1: Start at an outside corner and measure from outside corner to outside corner of the foundation.**

**Step 2: Select bottom plate and top plate.**

- If the wall is 16' or less, make plates out of solid lumber (meaning no joints).
- Ensure lumber is as straight as possible. Crooked lumber may lead to a crooked wall.

**NOTE:**
If the bottom plate is anchored to concrete, ensure it is treated lumber. Lay it beside the anchor bolts and mark the location for the anchor boltholes. Then drill a whole 1/4" larger than the anchor bolt.

**Step 3: Cut plates according to the measurement taken from the outside corner to the outside corner.**

**Step 4: Place top plate and sole plate on edge, or side by side.**

- Place tape measure at one end of plates and begin layout for common studs. (Figure 1).
- Load bearing wall studs are laid out at 16" on center.
- Non-load bearing wall studs are laid out at 24" on center.

**NOTE:**
16" for load bearing walls and 24" for non-load bearing walls is common practice. But always check local building codes.

**Step 5: Follow the building plans and determine where the center of all doors and windows are, and what the rough openings should be.**

- You will layout the trimmer studs and cripple studs just like the common studs, starting from the end of the plates.

**NOTE:**
Use trimmer / cripple studs for all openings in your wall.

**Step 6: After laying out all of your studs, it's time to measure and cut your headers.**

- That measurement should be your rough opening plus 3 inches.
- Three inches equals two trimmer studs (1-1/2" each trimmer stud).

**NOTE:**
Headers can be made out of 2x6, 2x8, 2x10, or 2x12 material. If you use a 2x12 header in a standard 8' wall, no additional cripple studs are needed between the headers and top plate. Where as 2x6 through 2x10 header will require cripple studs placed between the header and the top plate. Headers are built using two pieces of material side-by-side with a 1/2" spacer between them, nailed with 16d nails every 16" on center.

**Step 7: Trimmer studs extend from the bottom plate to the bottom of the header and supports the end of the header (Figure 3).**

- The trimmer stud is also nailed to the side of a common stud. The common stud is nailed between the sole plate and the top plate also on the end of the header.

**Step 8: The sill measurement is taken from the width of the rough opening between the trimmer studs and is nailed to the trimmer studs.**

**Step 9: Cripple studs are placed in between the sole plate, the sill, the header and the top plate (Figure 4).**

**Step 10: Corner posts are installed at the end of the wall in the corner, but not in the wall that butts up next to it in the same corner (Figure 5).**

**Step 11: Partition posts will be installed anywhere in the wall that has a partition wall intersecting in to it.**

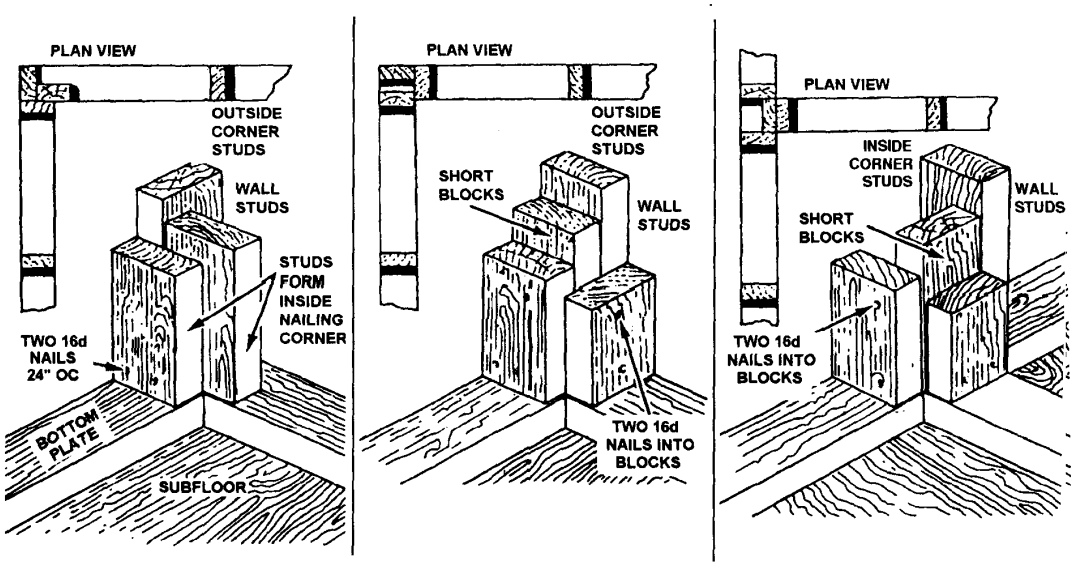


**Figure 1, Corner Stud Layout**

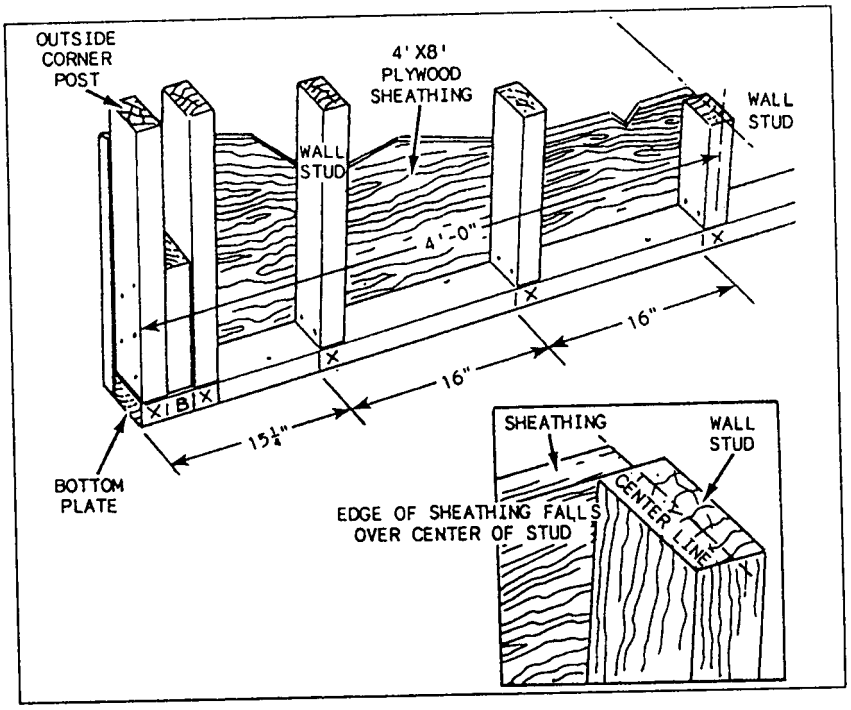


**Figure 2, View of Bottom Plate**

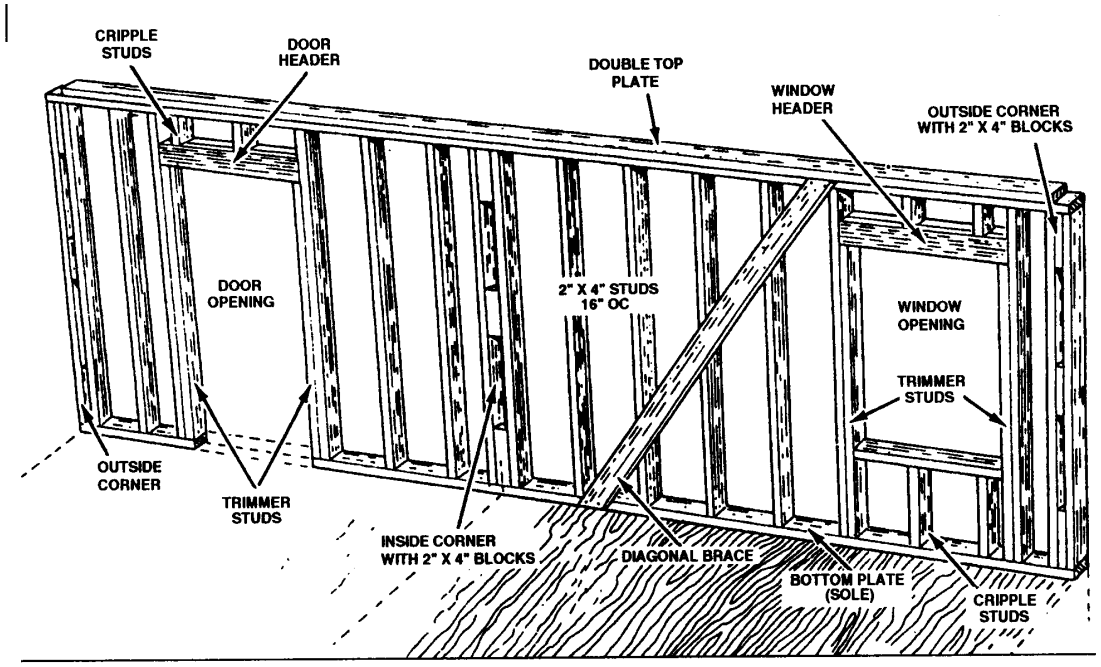


**Figure 3, Wall Layout**

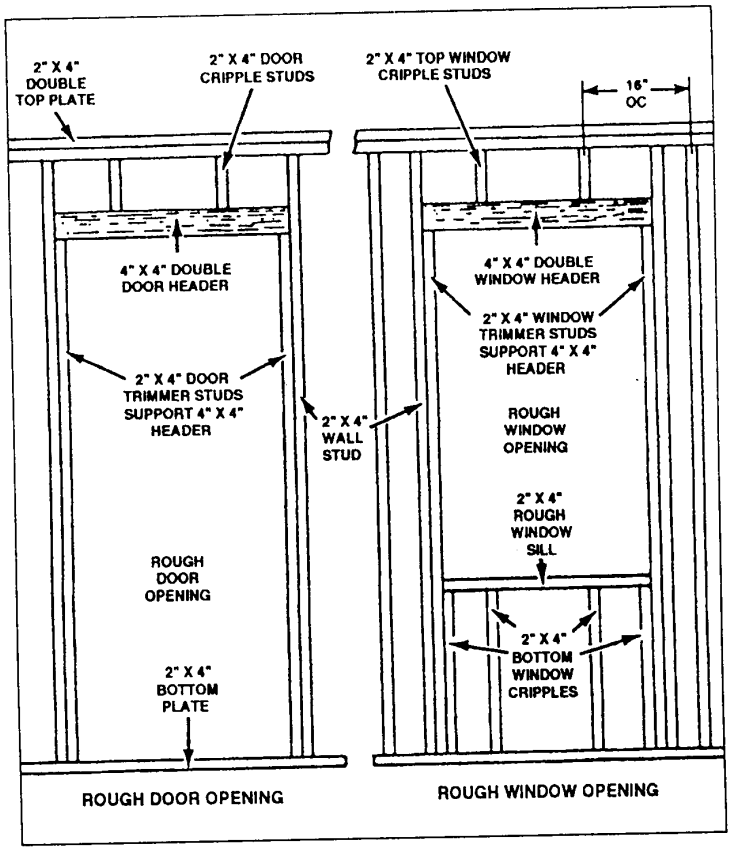


**Figure 4, Cripple Stud Layout**

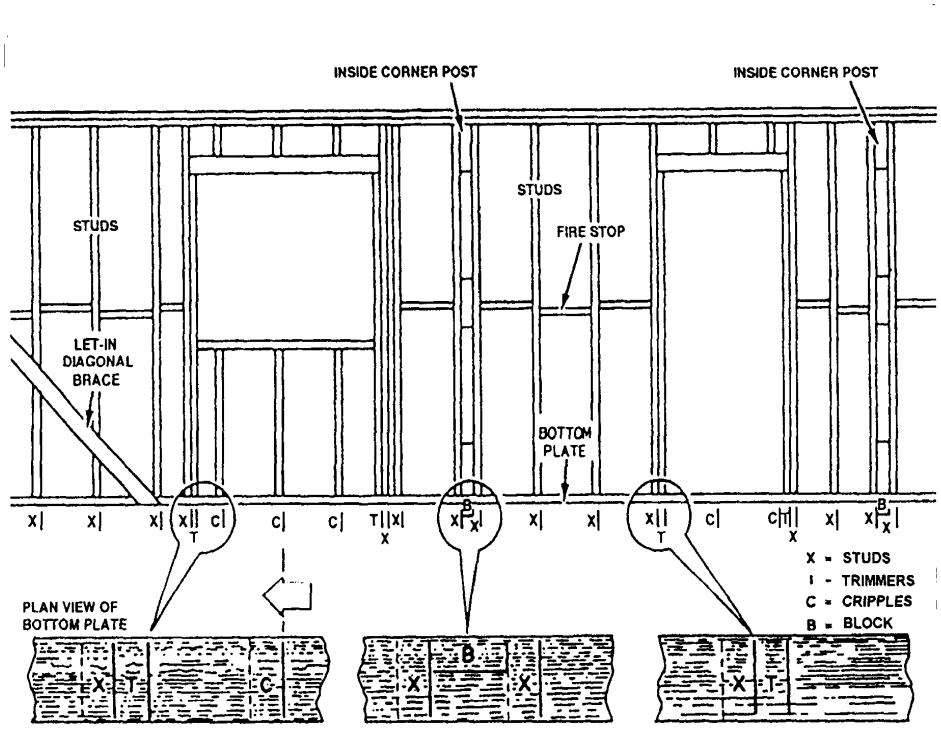


**Figure 5, Corner Posts**

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# Review Questions
# for
# Walls

| Question | Answer |
|---|---|
| 1. A sole plate runs along the bottom of the wall and is secured to the floor. | a. True<br>b. False |
| 2. A double top plate, is two 1x4s lying flat atop each other. | a. True<br>b. False |
| 3. Cripple studs will be nailed to a full-length stud and will support the end of a header. | a. True<br>b. False |
| 4. If you use a 2x12 header in a standard 8' wall, no additional cripple studs are needed between the header and top plate. | a. True<br>b. False |
| 5. Headers are built using two pieces of material side-by-side with a 1/2" spacer between them, nailed with 8d nails every 16" on center. | a. True<br>b. False |
| 6. If the bottom plate is anchored to concrete, ensure it is treated lumber. | a. True<br>b. False |

## WALLS

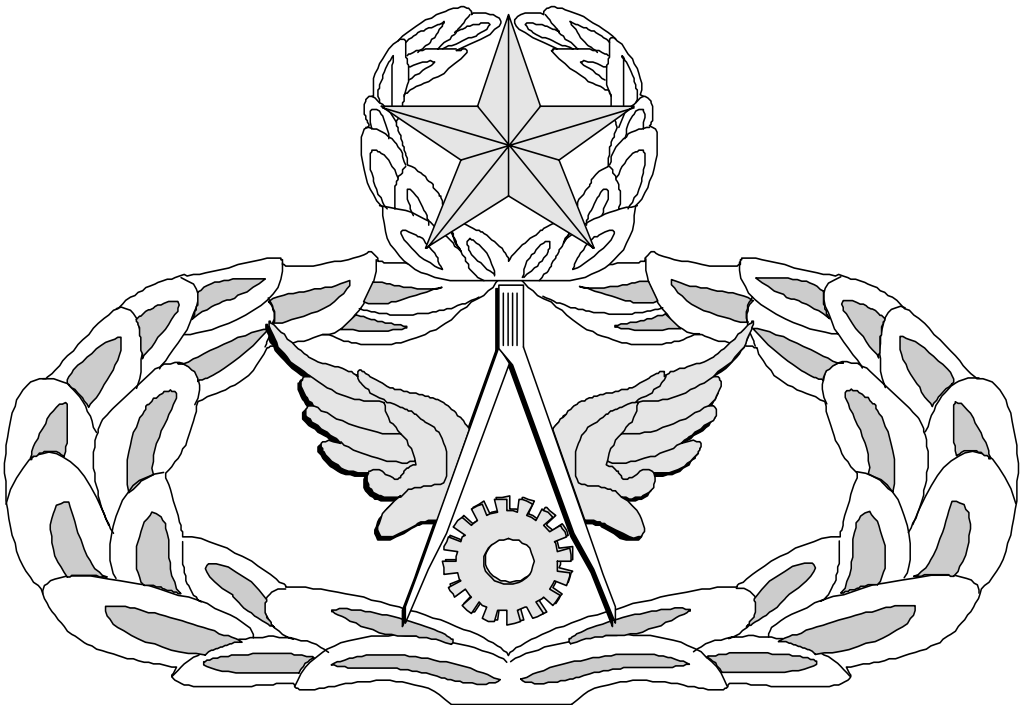
| Performance Checklist | | |
|---|---|---|
| **Step** | **Yes** | **No** |
| 1. Can trainee identify all components used to frame a wall? | | |
| 2. Can trainee assemble all vertical and horizontal components that form a wall structure? | | |

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

# Air Force Civil Engineer

## QUALIFICATION TRAINING PACKAGE (QTP)

## REVIEW ANSWER KEY



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## WALLS

## (3E3X1-16.3.1.)

| Question | Answer |
|---|---|
| 1. A sole plate runs along the bottom of the wall and is secured to the floor. | a. True |
| 2. A double top plate, is two 1x4s lying flat atop each other. | b. False |
| 3. Cripple studs will be nailed to a full-length stud and will support the end of a header. | b. False |
| 4. If you use a 2x12 header in a standard 8' wall, no additional cripple studs are needed between the header and top plate. | a. True |
| 5. Headers are built using two pieces of material side-by-side with a 1/2" spacer between them, nailed with 8d nails every 16" on center. | b. False |
| 6. If the bottom plate is anchored to concrete, ensure it is treated lumber. | a. True |